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Topology of exceptional points

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Exceptional points are band-touching points that are unique to non-Hermitian systems[1]. At the exceptional points, two eigenstates coalesce, resulting in square-root dispersion. The emergence of exceptional points is ubiquitous as they are observed for a wide range of systems from quantum systems[2] though meta-materials[3] to geophysical fluid dynamics[4].
In this talk, we discuss topology of exceptional points with/without symmetry[5]. Specifically, we show that symmetry may enrich exceptional points leading to symmetry-protected exceptional rings (surfaces) in two (three) dimensions. We also demonstrate that strongly correlated electrons may host such exceptional points, rings, and surfaces. Furthermore, we extend the analysis to multi-fold exceptional points (i.e., non-Hermitian band touching of three or more bands) which is beyond the periodic table of Bernard-LeClair symmetry classes[6]. Based on resultant of the characteristic polynomial, we clarify the topological aspect of multi-fold exceptional points[7]. Our framework also elucidates the robustness of non-Hermitian band touching reported for acoustic meta-materials.

References:
[1] H. Shen et al., Phys. Rev. Lett. 120, 146402 (2018).
[2] N. Hatano, Mol. Phys. 117 2121 (2019).
[3] W. Tang et al., Science 370, 1077 (2020).
[4] A. Lecleric et al., Phys. Rev. Res. 6, L012055 (2024).
[5] T. Yoshida et al., Phys. Rev. B 99, 121101 (2019).
[6] K. Kawabata et al., Phys. Rev. Lett. 123, 066405 (2019).
[7] P. Delplace et al., Phys. Rev. Lett. 127, 186602 (2021); T. Yoshida et al., Phys. Rev. Res. 7, L012021 (2025); T. Yoshida et al., arXiv:2504.13012.

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